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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-segregated aerosol chemical composition at a boreal site in southern Finland, during the QUEST project" *by* F. Cavalli et al.

Anonymous Referee #1

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General

This study focuses on the analysis of the chemical composition of atmospheric aerosol particles present during the time of nucleation events and non-events in Hyytiälä, southern Finland. The authors present a very conclusive picture of the processes going on in the two different situations, with preexisting low particle mass concentrations during nucleation events and *vice versa* in the case of non-events. Also the impact of the prevailing air mass origin is shown. As a result of this study, the authors con-

clude about the importance of low volatility products from biogenically emitted reactive VOCs such as monoterpenes on the occurrence of nucleation events. While organic compounds from anthropogenic sources are usually linked to polluted air masses with higher aerosol mass loadings and consequently are associated with non-event situations.

In general this paper is written in an excellent style and the authors present new findings on the important aspect of the chemical composition of new particles and I would like to congratulate them for their nice work done.

Specific comments

There are some minor comments I have concerning some points mentioned:

1. During the first reading of the paper I was confused with the times associated with nucleation events and non-events, both given with the same date, although the authors state correctly that there are nucleation days and non-nucleation days and that the sampling took place for 7 days for each sample, with alternative sampling to the present conditions (nucleation or no nucleation). May I ask the authors to switch the names to the time scales of the samples, e.g. ne-170303-260303 instead of ne-170303, to provide an easier identification of the sampling period? A picture showing a n example day and the splitting in both would be nice, but is not needed in this context.

2. Seven day sampling is quite a long time for organic compounds to be collected while air is passing containing all ambient oxidants and with varying concentrations in the gas-phase. Certainly, I am aware of the time needed to collect

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sufficient amounts of mass, but I would be interested in the more short lived compounds participating in the nucleation as well. I suspect them to be converted to acids or carbonyl compounds with the longest chemical lifetime among the oxidation products available. What do the authors think about this?

3. One comment concerning the identification of oxidation products by comparing the H-NMR spectra to smog chamber results of the monoterpene α-pinene. The approach is quite valid and a reasonable idea, but the used concentration of 5 to 10 ppmv is at minimum about 20000 times higher than the ambient concentrations of monoterpenes in the boreal forest at that time. It might be that even more volatile compounds like carbonyl compounds will significantly contribute to the aerosol mass in the smog chamber while they don't under ambient conditions. Also the high NO_X concentrations might overestimate nitrogen containing species for the present site. Nevertheless, this approach is reasonable.

4. A very nice result is Figure 2, indicating the important role of water soluble organic compounds at nucleation conditions and the opposite effect for non sea-salt sulfate as well as for ammonia. Interesting is the large contribution of unaccounted material during the nucleation events. Can the authors speculate more about this? Is this probably a mixture of several group types or reactive compounds of e.g. a further VOC oxidation with several carbon double chains? I am sure that this is a risky business, but it might be of high importance for the nucleation process.

Technical corrections

Figure 6: Please switch the green colour of the 'modified' case to yellow. I guess it has become green by accident but should be correct in the final version to stick

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Interactive Comment

to the legend.

p. 8864ff.: I would suggest to switch the expressions ‘clean’, ‘modified’ and ‘ slightly modified’ to ‘clean’, ‘polluted’ and ‘slightly polluted’ probably including the word ‘anthropogenic’ to make it clear to the reader what is meant, since the authors didn’t modify the samples but the air mass was different.

I suggest accepting this interesting article in the focus of Atmospheric Chemistry and Physics with some minor technical corrections.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 8851, 2005.